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ABSTRACT

Why mathematics should be learned is discussed. Its role as an important active force in the development of our civilization, and as the most useful subject taught in our schools, next to English, is noted. The primary objective of all mathematics work is to help man study nature, and some practical achievements of this connection are noted. Mathematics is also important in a number of fields, such as the social sciences, business, medicine, military science, communication, and transportation. Then, mathematics as a beautiful art form is discussed, and its relationship to music is described. What mathematics should mean to ministers is also noted. The relevancy of pure mathematics, which may seem to have no practical use, is detailed. Finally, that mathematics trains the mind to think clearly is propounded. A closing comment stresses everyone's need for mathematics. (MNS)

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WHY MATHEMATICS?

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WHY MATHEMATICS

The importance of mathematics to our Country is so great that we must speak out (verbally and in print) about the pressing need we see in regard to mathematics. The student may ask why he is asked to learn mathematics. Is it because Plato, some 2300 years ago, advocated mathematics to train the mind for philosophy? Is it because the Church in medieval time taught mathematics as a preparation for theological reasoning? Or is it because the commercial, industrial, and scientific life of the western world needs mathematics so much? Perhaps the subject got into the curriculum by mistake and no one has taken the trouble to throw it out.

It is believed by many that mathematics has been and still is one of the most important active forces in the development of our civilization; and next to the English language, the most useful subject taught in our schools. Mathematics ranks with reading and writing as one of the cornerstones of modern civilization.

In 1623 the Great Italian Scientist, Galileo wrote, "That vast book which stands forever open before our eyes, the universe, cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language. Without mathematics, it is humanly impossible to comprehend a single word."

The primary objective of all mathematical work is to help man study nature, and in this endeavor, mathematics cooperates with science. The fact that mathematics is of central importance in the study of nature,

reveals immediately several values of this subject. A few of the practical achievements already attained are as follows:

- (1) the construction of bridges and skyscrapers
- (2) the harnessing of the power of water, coal, electricity, and the atom
- (3) The effective employment of light, sound, and radio in illumination, communication, navigation and even entertainment
- (4) the advantageous employment of chemical knowledge in the design of materials, in the production of useful forms of oils, and in medicine.

With such development as the advent of statistics and the computer, the uses of mathematics have spread far and wide, so that the social sciences, particularly psychology, economics, political science, and even the fields of sociology, anthropology, linguistics, law, history, and literature are becoming to some extent mathematicized. Modern business as well as most other phases of our culture, such as technology, medicine, military science, and our marvelous communication and transportation facilities are based on the sciences; and these, in turn are based to a large extent on mathematics.

Mathematics is a beautiful art form. Why should anyone stress the beauty of such a useful subject? Simply because we are humans, and humans pursue activities such as painting pictures and playing music. Among the values which mathematics offers are its services to the art. In an age when specialization mean isolation a layman might be surprised to hear that mathematics and art are intimately related. Mathematics is the sister, as well as the servant of the arts and touched with the same madness and genius.

To begin with, the visual arts are spatial by definition. It is therefore, not surprising the Euclidean geometry is evident in classic

architecture or that the ruler and compass have been as familiar to the artist as the artisan. Analysis of great painting reveals structure based on line and circle. Ancient records and monuments testify to effective calculation and precise measurement of lengths and angles. At least as early as the fifth century B.C., artists were searching for ideal proportions and mathematical principles of composition.

The revolution in art and mathematics has only deepened the relations between them, and this is borne out by the psychology of practitioners in both fields. It is a common observation that the emotional drive for creation and the satisfaction before success is the same whether one is constructing an art object or a mathematical theory. The new mathematics and the new art are capable of an intimacy that we have not seen since the Renaissance.

The service mathematics renders to music has not only enabled man to understand it, but has spread its enjoyment to all corners of our globe. For nearly a thousand years, mathematics remained grouped with music. It was the Renaissance of the fourteenth and fifteenth centuries that western man began to separate the two.

The resemblance between music and mathematics begins at the creative stage; the act of composing music seems to have some affinity with the discovery of mathematical facts. Both art and music are essentially abstract and both can be written down in a notation that is universally accepted.

Names of great mathematicians who have written on music are more than plentiful. Euclid wrote at least one genuine work on music, "Division of the Monochord", which contains a series of propositions about musical intervals. It is well known that music was one of the main interests of the

Pythagoreans. To Pythagoras, himself, is attributed the discovery of many of the numerical ratios corresponding to the principal intervals of the musical scale: octave 2:1; fourth 4:3; fifth 3:2.

The three general areas of melody, harmony, and rhythm cited as a few examples of the applications of mathematics. Mathematical properties were related to various aspects of musical composition. It was noted that some jazz musicians use these properties for improvisation whether or not they know the theoretical basis.

Let's take a look at mathematics and the ministry. A person such as a clergyman who claims insight or competence in a particular field but lacks scientific training is at a considerable disadvantage. In order to have a serious impact on the world, he must combine within himself the skills by which science controls the world and the insight which religion sheds on the direction this control should take. A solid grounding in mathematics is a prerequisite for this scientific knowledge. The minister who has a mathematical background is in a position to associate himself with a large segment of the population which sees science as the new Messiah. By employing the native tongue of these people, a mathematically sophisticated minister is better able to communicate intimately with them and to witness to them the good news of the gospel.

Applications do not constitute the only uses of mathematics. Pure mathematics, which may seem to have absolutely no practical use, is very useful. There are many examples that occurred, such as the discovery of planets and other celestial bodies, simply because it was possible to create mathematical theories that would be validated only if such spatial objects existed.

Today, occurrences of pure mathematics suggesting phenomena in the so-called real world have been increasingly found in the applications of mathematics to the social sciences. This began long ago, when Pascal and Fermat studied certain problems; and the solutions are considered the introduction to the theory of probability. Today applications of the theory in economics and in biology are commonplace. And not long afterward, the English astronomer, Edmund Halley, published in 1693 his work on life annuities, which was the precursor of modern actuarial theory.

The theory of games, which is a product of research in pure mathematics, is finding increasing application. The same may be said of graph theory which was chiefly developed as part of the field of topology, but which is rapidly becoming a field by itself stimulated by its uses in physics and the various behavioral sciences. And I hardly need speak of the computer, long a dream of the pure mathematician, which has not only permeated all departments of human activity but like statistics, has led to the formation of separate departments of computing in our universities.

Mathematics trains the mind to think clearly and it is the greatest mental game that man has ever discovered. A person properly trained in mathematics should be able to take a marketing problem, for example, analyze the assumptions that underlie existing procedures, study their validity, and create corrected sets of assumptions that would lead to refinements in what is being done. One does not use his technical mathematical training so much as their abilities to analyze problems.

In essence, mathematics is concerned primarily with what can be accomplished by reasoning. Why should one reason when everyone has five senses? Senses are limited and often fallible. Senses are helpless in

obtaining certain knowledge, such as the distance to the sun, the size of the earth, the speed of the bullet, the temperature of the sun, the prediction of eclipses, and many other facts.

The lawyer, the doctor, the scientist, and the engineer employ reasoning daily to derive knowledge that would otherwise not be obtained or perhaps obtainable only at great expense and effort. Mathematics more than any other human endeavor relies upon reasoning to produce knowledge.

Mathematics have been known to save a life. In the early 1900, Paul Wolfskehl, a professor of mathematics in Darmstadt, Germany, spent many long hours in a vain attempt to prove a mathematical theorem. He was also disappointed in love and decided to end his life. Being a methodical man, he set the time that he planned to end his life. While awaiting the set hour, he decided to try to prove the theorem once again. He became so engrossed in his work the set hour arrived and passed. He did not solve the theorem and he did not end his life.

Do you still have doubts? Nothing ventured, nothing gained. The subject is within your grasp and no special gifts or qualities of mind are needed to learn mathematics. You should recognize that mathematics has content which serves the physical and social scientist, the philosopher, logician, and the artist; content which influences the doctrines of the statesman and the theologian; content which satisfies the curiosity of the man who surveys the heavens and the man who muses on the sweetness of musical sound.

Many years ago Benjamin Franklin asked "What Science can there be more noble, more excellent, more useful for men, more admirably high and

deemonstrative than this of mathematics?" That question has the same answer today as it had then. The answer is none.

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